DOCUMENT RESUME

ED 107 721 TM 004 579

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TITLE An Attitudinal Study of Computer-Assisted Testing as a Learning Method.
INSTITUTION National Citizens Conference on Rehabilitation of the Disabled and Disadvantaged, Washington, D.C.
PUB DATE [Apr 75]
NOTE 13p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, D. C., March 30-April 3, 1975)

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS Attitude Tests; College Students; *Computer Assisted Instruction; *Computer Programs; Feedback; Higher Education; Instruction; Learning; Multiple Choice Tests; *Student Attitudes; Student Evaluation; Teaching Methods; *Testing
IDENTIFIERS Canada; *Computer Assisted Testing

ABSTRACT

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ED107721

papers in higher education

AN ATTITUDINAL STUDY OF COMPUTER-ASSISTED TESTING AS A LEARNING METHOD

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ABSTRACT

The study investigated the effects of exposure to computer-assisted testing (CAT) as an effective instructional method and its effects on attitudes toward computer-assisted instruction (CAI). Five computer quizzes consisting of twenty randomly drawn multiple-choice questions were individually administered on ten teletype terminals. A feedback mechanism was incorporated in the CAT program and provided detailed explanations of questions. Results indicated that Ss exposed to CAT had significantly more favourable attitudes toward CAI than Ss not exposed to CAI. In addition, CAT was perceived by students to be an effective instructional method in aiding mastery of conceptual and factual material.

An Attitudinal Study of Computer-Assisted Testing As A Learning Method

Educators and psychologists have become increasingly aware of the psychological and sociological problems inherent in the typical classroom approaches to learning of which evaluation forms an integral part. The construction of achievement examinations is a task many instructors find difficult and which requires a considerable amount of time and energy.

In recent years, computers have been used to generate examinations for traditional courses (Ansfield, 1973; Brown, 1973; Dudley, 1973), and for student-paced courses (Cohen & Cohen, 1973). Theoretically, these tests should provide the student with valuable information via the correct answers, yet the use of the computer in providing diagnostic feedback on student examination results has been limited. Ansfield (1973) describes the Automated Examination Generator (AEG) in use at the University of Wisconsin at Oshkosh, a program designed to generate examinations from an item bank, grade academic achievement, record each student's performance, and provide some individual comments designed to remediate particular scholastic weaknesses.

To achieve optimal learning however, it has been argued that an essential element, that of immediate knowledge of correct results (KCR), is missing (c.f. Skinner, 1968). But most computer generated examinations have as their primary aim evaluation. Computer constructed examinations can provide efficient, low cost, quality procedures for repetitive evaluations of performance using equivalent examination forms (Cartwright, 1975). Nevertheless, most attempts at computer-assisted test construction (CATC) have centered on the production of pencil-and-paper varieties of multiple-choice items which lack the provision for immediate feedback, and consequently for improved learning.

One of the reasons for the lack of immediate feedback on computer-constructed

tests is that although the test is generated and scored by the computer, the student has no actual contact with the machine, often resulting in relatively long delays between the writing of the test and the return of the results.

An alternative method of resolving this difficulty would be to allow the computer to actually administer the test and provide feedback, in process, on each test item as it is encountered. While this form of computer-assisted testing (CAT) is more costly than CATC, there are positive advantages. In addition to immediate feedback regarding the correct response, elaborate feedback paragraphs can be provided containing text page numbers for further study and explanations as to why alternative responses were incorrect. This then constitutes a form of interactive computer-assisted testing and in many ways resembles computer-assisted instruction (CAI) because of its provision for immediate feedback.

Student attitudes toward specific methods of learning, including CAI, have been shown to be highly correlated with achievement (Bundy, 1968). Mathis, Smith and Hansen (1970) concluded that exposure to CAI produced positive attitudes towards CAI as a learning method. In addition, Goodman (1968) has suggested that attitudes towards CAI may be modified by particular programs and systems.

Students often have particular attitudes toward certain instructional methods even though they may never have experienced those methods. It is possible that these attitudes may be modified by exposure to other similar instructional systems. Thus, the present study attempted to ascertain the effect of exposure to CAT on attitudes towards CAI as well as assess student perceptions as to its usefulness as an instructional method.

METHOD

Subjects

The subjects were 29 male and 95 female students all having at least an

undergraduate degree with a mean chronological age of 21.75 years, enrolled in a one year elementary teacher education program at McGill University. Of the 124 subjects, 51 majored in early childhood education (kindergarten through grade 3), 60 in later childhood education (grades 4 through 7), 9 in French as a second language (kindergarten through grade 7) and 4 in art education (kindergarten through grade 7).

Procedure

Students were assigned to one of six sections of an introductory course in educational psychology at McGill University. Although all subjects produced written assignments for course grades, subjects in three sections were exposed to CAT while subjects in the remaining three sections were exposed to more traditional types of evaluations such as classroom quizzes and final examinations. Five hour-long computer quizzes were designed and administered to students in the experimental group. Each quiz contained twenty multiple-choice questions randomly selected for each student from a bank of items. The test items were keyed to the course text (Biehler, 1971) and were supplied by the publisher. After each question, the student typed in a response and was informed if his response was correct or incorrect. In addition, students had the option of requesting a feedback paragraph. This feedback paragraph was a significant feature of the computer quizzes and provided explanations giving the correct response, the reason it was correct, the reasons alternatives were incorrect, and a page number in the course text for further reference. The pass criterion for each quiz was set at 70% and students who did not meet the criterion were required to repeat the quiz. Quizzes were administered on ten teletype Model 33 terminals.

At the end of the academic year, the Teaching Methods Questionnaire II (Cartwright, 1973) was administered to all students. This questionnaire is a revision

of one developed by McLeish (1970) to which were added revisions of items by Foster (1970). The questionnaire consists of five scales of ten items each, designed to elicit attitudes towards lectures, tutorials, seminars, programmed instruction (PI), and computer-assisted instruction. Students were given a descriptive paragraph on each teaching method, with items relating to it. They were asked to rate each item on a four point scale, ranging from strongly agree to strongly disagree. The questionnaire yields five scores, one for each of the teaching methods involved. In addition, biographical information and data on student's perceptions of CAT and computers in general were obtained from each student.

RESULTS

Scores on the five scales of the Teaching Methods Questionnaire II were computed and t tests were performed to determine if differences in attitude existed between the CAT and non-CAT groups.

Insert Table 1 about here

The figures in Table 1 suggest that compared to the non-CAT group, the CAT group scored significantly higher on scales measuring attitudes towards lectures, programmed instruction, and computer-assisted instruction. In addition, compared to the non-CAT group, students exposed to CAT tended to perceive the computer quizzes as being more of a learning than an evaluative experience ($\underline{X}^2 = 4.78$, $df = 1$, $p < .05$), reported learning more from computer quizzes than traditional classroom examinations ($\underline{X}^2 = 28.23$, $df = 1$ $p < .001$), and in general tended to rate CAT as being superior to traditional classroom exams ($\underline{X}^2 = 6.29$, $df = 1$, $p < .05$). These results were unrelated to the age or sex of the subjects.

A one-way analysis of variance however, ($F(3, 120) = 3.99$, $p < .01$) suggested that subjects in the different teacher education programs differed in their attitudes toward the computer quizzes. Further analysis revealed that students in programs leading to teacher certification in early childhood education had significantly more positive attitudes toward CAT than did students in later childhood programs (Scheffé, $p < .01$).

DISCUSSION

The fact that students exposed to computer-assisted testing showed significantly higher attitudes towards both CAI and PI supports Goodman's (1968) contention that attitudes towards CAI may be modified by particular programs and systems, and suggests that attitudes towards various learning methods may be generalized from experience with similar learning methods. It was expected that exposure to computer-assisted testing would produce some shift in attitudes towards CAI and perhaps PI, however it was not clear why attitudes towards lectures would also be positively affected. One possible explanation suggested by an independent evaluation of the course (Barnett, 1974) is that the instructors who initiated the computer quizzes were perceived by students to be better lecturers and that this perception may have been reflected in the responses on the lecture scale.

The students' perception of the computer quizzes as a learning rather than an evaluative experience lends support for the continued study of this type of computer-assisted testing as a learning method. Because of the interactive nature of the program, KCR, explanatory feedback paragraphs, and keyed text page number can all be provided immediately after each item. In addition to receiving valuable information on the required concepts, students are continuously conscious

of their progress during the test. Perhaps it is for these reasons that students tended to report learning more from interactive computer-assisted testing and tended to rate it as superior to traditional classroom exams.

The finding that participants in different teacher education programs held different attitudes towards CAI was not unexpected though it was predicted that the effect would be in the opposite direction. It was expected that students in early childhood education who tend to be more humanistic and child-centered would see CAI as cold and dehumanizing, while those in later childhood, who are subject-oriented would be more favorable to CAI. In addition, it was thought that later childhood students might perceive the more practical applications of computers in the classroom. The reverse was found to be the case, and the reasons for this remain unclear. Nevertheless, it is important to note that differences in attitude do exist among different program participants and this may be of interest to teacher educators.

While interactive computer-assisted testing remains a more expensive form of testing, numerous advantages become evident. The actual programming of test items is relatively simple since the structure of every item is basically the same as every other item. Usually, the task can be undertaken with a minimum of error by relatively unsophisticated student assistants. Unlike many other educational innovations, computer-assisted testing is less threatening in that it need not change the role of the instructor and can often be introduced into conventional courses with existing staff. From a learning point of view, the ability to provide various kinds of immediate feedback in a testing situation would seem to offer unique possibilities for further research investigating the role of feedback in learning. It would appear that the use of interactive computer-assisted testing represents a viable alternative to both CATC and more traditional forms of classroom evaluation.

Table 1

Means and t Values for Differences in Student Exposure to Computer-Assisted Testing

Sub-scales of the Teaching Method Questionnaire II	Means		df	t	p*
	CAT	Non-CAT			
Lecture	11.83	10.08	122	2.14	.03
Tutorial	16.01	16.70	122	-1.24	.22
Seminar	16.18	17.02	122	-1.31	.19
Programmed Instruction	14.24	12.79	122	2.05	.04
Computer Assisted Instruction	15.18	13.79	122	2.00	.05

* two tailed test

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